

# Computational Semantics

## Assignment 2: Model Checking and Lexical Semantics

### Difficult sentences:

*We define a three place relation — called satisfaction — which holds between a formula, a model, and an assignment of values to variables. Given a model  $M = (D, F)$ , an assignment of values to variables in  $M$  (or more simply, an assignment in  $M$ ) is a function  $g$  from the set of variables to  $D$ .*

I found this difficult because I didn't fully understand why an assignment of values is a function  $g$ . How does  $g$  fit into the whole?

*Once again, instead of making use of a special sort of variable that is restricted in its interpretation, we have made use of an extra unary relation symbol (here, *inanimate*) which we insist be interpreted by the individuals in the relevant sort.*

I don't understand what is meant here. Maybe because it is the last part of a section which I did not read before because I only use

### Assignment 1.1.5.

1. *If someone is happy, then Vincent is happy.*

$\exists x \text{HAPPY}(x) \rightarrow \text{HAPPY}(\text{VINCENT})$

2. *If someone is happy, and Vincent is not happy, then Jules is happy or Butch is happy.*

$\exists x (\text{HAPPY}(x)) \wedge \neg \text{HAPPY}(\text{VINCENT}) \rightarrow (\text{HAPPY}(\text{JULES}) \vee \text{HAPPY}(\text{BUTCH}))$

3. *Everyone is happy, or Butch and Pumpkin are fighting, or Vincent has a weird experience.*

$\forall x \text{HAPPY}(x) \vee \text{FIGHTING}(\text{BUTCH}, \text{PUMPKIN}) \vee \text{WEIRDEXPERIENCE}(\text{VINCENT})$

4. *Some cars are damaged and there are bullet holes in some of the walls.*

$\exists c \text{DAMAGED}(c) \wedge \exists w \text{BULLETHOLES}(w)$

5. *All the hamburger are tasty, all the fries are good, and some of the milkshakes are excellent.*

$\forall h, f (\text{TASTY}(h) \wedge \text{GOOD}(f)) \wedge \exists m \text{EXCELLENT}(m)$

6. *Everybody in the basement is wearing a leather jacket or a dog collar.*

$\forall x (\text{BASEMENT}(x) \rightarrow (\text{WEARING}(x, j) \vee \text{WEARING}(x, c)))$

### Assignment 1.1.7

- |   |                            |
|---|----------------------------|
| 1. $\text{robber}(y)$   | $y$ = free                 |
| 2. $\text{love}(x, y)$  | $x$ and $y$ = free         |
| 3. $\text{love}(x, y) \rightarrow \text{robber}(y)$                       | $x$ and $y$ and $y$ = free |
| 4. $\forall y (\text{love}(x, y) \rightarrow \text{robber}(y))$           | $x$ = free, $y$ = bound    |
| 5. $\exists w \forall y (\text{love}(w, y) \rightarrow \text{robber}(y))$ | $w$ and $y$ = bound        |

### Assignment 1.1.10

- |   |      |
|---|------|
| 1. $\exists x \text{love}(x, \text{vincent})$   | True |
| 2. $\forall x (\text{robber}(x) \rightarrow \neg \text{customer}(x))$                             | True |
| 3. $\exists x \exists y (\text{robber}(x) \wedge \neg \text{robber}(y) \wedge \text{love}(x, y))$ | True |

## Assignment 1.1.11

$M = \langle D, F \rangle$

$D = \{d1, d2, d3\}$

$F(\text{VINCENT}) = d1$

$F(\text{BUTCH}) = d2$

$F(\text{JULES}) = d3$

$F(\text{HAS-GUN}) = \{d1\}$

$F(\text{AGRESSIVE}) = \{d1, d3\}$

$F(\text{HAS-MOTORBIKE}) = \{d2\}$

## Modeling

The files for the modeling can be found in the zip-file.

## Explanation software tool

To check if a model is well formed syntactically and semantically, a program should have several aspects. First to check the syntax, the system should have rules that check (for example) if there is a period at the end of predicates. Another example that could be checked are non-logical symbols could be checked to see if they have a corresponding WordNet synset.

For checking the semantics, some natural language processing is needed. Using a resource like NLTK, this would be possible.